SOUTH PUYALLUP RIVER BRIDGE Mount Rainier National Park Spanning South Puyallup River on West Side Road Longmire Vicinity Pierce County Washington HARR No. WA-52

HAER Wash 27-LONG.Y 20-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD National Park Service U.S. Department of the Interior P.O. Box 37127 Washington, D.C. 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

SOUTH PUYALLUP RIVER BRIDGE Mount Rainier National Park HAER WA-52

HAER WASH 27-LONG.Y 20-

I. INTRODUCTION

Location:

Spanning South Puyallup River on West Side Road, 5.5 miles north of Nisqually Road, Mount Rainier National

Park, Pierce County, Washington.

Quad: Mount Wow, Wash. UTM: 10/584640/5184220

Date of Construction:

1930-31

Structure type:

Stone-faced reinforced concrete filled spandrel arch

bridge

FHwA Structure No.:

9450-030P

Designer and Engineer:

Western Regional Office, Bureau of Public Roads, San

Francisco, California

Contractor:

W. T. Butler Company, Seattle, Washington

Owner:

Mount Rainier National Park, National Park Service

Use:

Park road bridge (restricted use)

Significance:

The South Puyallup River Bridge is characteristic of the "rustic style" of architecture employed by the National Park Service in the 1920s and 1930s. A facing of rubble masonry conceals the structure's reinforced concrete barrel vault, helping the structure blend into its rugged surroundings.

Project Information:

Documentation of the South Puyallup River Bridge is part of the Mount Rainier National Park Roads and Bridges Recording Project, conducted in the summer of 1992 by the Historic American Engineering Record.

Richard H. Quin, Historian, 1992

II. HISTORY

This is one in a series of reports prepared for the Mount Rainier National Park Roads and Bridges Recording Project. HAER No. WA-35, MOUNT RAINIER NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. WA-122, WEST SIDE ROAD, contains more specific information on the road on which the structure is located.

West Side Road

The West Side Road, built in sections between 1926 and 1935, was originally intended to link the Nisqually Road near the park's southwest entrance with the Carbon River area in the northwest. The road was to be the western link in a projected "round-the-mountain" circuit road system. Work began in 1926 under the supervision of the Bureau of Public Roads. However, a change in Park Service policy dictated that the north and northwest sections of the park would be left as roadless areas, and the West Side Road project was halted in 1935. Only half of the road, between the Nisqually Road and the North Fork of the Puyallup River, was completed.

The 12.5-mile road leaves the Nisqually Road one mile east of the Nisqually Entrance. It runs northeast and north for roughly three miles on a bench above the west bank of Tahoma Creek, and along the west side of Fish Creek. The road crosses the creek and continues north to Tahoma Vista, then veers west and then north again on a series of looping curves and switchbacks to Round Pass, nine miles north of the Nisqually Road. From Round Pass, the road drops on a sharp long switchback to the South Puyallup River crossing. The West Side Road then continues generally northwest to the St. Andrews Creek Bridge [HAER No. WA-51] and a mile further to the present road terminus at Klapatche Ridge. The road originally continued east another two and half miles to the North Puyallup River, but this section has been closed to vehicles and is now the North Puyallup Trail.

Following a recurring series of debris flows on Tahoma Creek, the West Side Road was closed to public travel at Fish Creek in 1989. The road is open in rough condition through the flood-prone area but access is limited to official vehicles. The National Park Service is presently [1992] deciding whether or not to reopen the road.

For a complete history of the West Side Road, see the related report in this series, HAER No. WA-35d.

South Puyallup River Bridge

The West Side Road spans the South Puyallup River on a "rustic style" stone-faced arch bridge. The structure is actually a reinforced concrete filled spandrel arch structure, and the stone veneer serves mainly to help it blend into the rugged surroundings. The bridge was built in 1930-1931 in conjunction with the St. Andrews Creek Bridge [HAER No. WA-51] two and half miles northwest; this work constituted a separate contract from the construction of the roadway section, which was in progress when the bridge project began.

The final surveys for the West Side Road were undertaken in 1925 and 1926 by the Bureau of Public Roads, which in 1925 assumed responsibility for major road projects in the national parks. BPR Resident Engineer located the site for the South Puyallup River crossing in September 1925. He described it in his monthly report to the BPR District 1 office in Portland, Oregon.

The crossing of the South Puyallup River is a narrow rock gorge about 30 ft. wide. It is an excellent location for a small masonry arch. The road crosses about 150 ft. below the falls on the Puyallup River" and is so located that the falls will be visible from the bridge. These falls are about 20 ft. high and have a very pretty setting. When the water is high and carrying large rocks from the glacier, "they produce a roar much greater than the falls of St. Andrews."

The suggestion of a masonry-faced arch bridge for the site was accepted by the National Park Service's Division of Landscape Architecture, and the Bureau of Public Roads was directed to proceed with the preparation of designs and specifications. A temporary span across the stream was constructed in 1929 by Joplin & Eldon of Portland, Oregon under terms of their 1926 grading contract for the segment of the West Side Road between the Nisqually Road and the stream crossing.²

Construction drawings for the bridge were prepared by the San Francisco regional office of the Bureau of Public Roads in December 1929. The architectural sheets, showing general design details, were prepared by the Park Service's Landscape Architecture Division under the supervision of Chief Landscape Architect Thomas C. Vint. These plans for the structure were approved by Mount Rainier National Park Superintendent O.A. Tomlinson in March 1930. Following the approval of the plans and specifications by the National Park Service's Washington office, the Department of the Interior authorized the advertising of the project.

The joint contract for the construction of the bridge and a nearby span over St. Andrews Creek was awarded on 15 July 1930 to the W.T. Butler Company of Seattle, which had submitted the low bid of \$36,580.00.6 Butler established his work camp in late July and began operations.7 Resident Landscape Architect Ernest A. Davidson was field supervisor for all landscape matters relating to the project.8

An early change order required the removal of the existing temporary bridge at the site and its replacement with one directly over the permanent bridge site. This would protect the landscape from scars which would have been caused by construction of a detour road to the existing temporary bridge site. The new temporary span was included in the Butler contract. Specifications indicate that it was to be at least 14' in width and strong enough to carry 35 tons. The project engineer estimated the cost of the removal of the old structure and construction of the new temporary span at \$4,500.9

BPR engineers estimated the following quantities of materials would be required for the bridge's construction:

Class B concrete .	•	•	•	•	•	•	•	•	112 cu.	yds.
Class "C" concrete .	•	•	•	•	•	•	•	•	. 55 cu.	yds.
Reinforcing steel	•	•		•	•		•	•	. 16,500	lbs.
Arch ring facing		•	•				•	•	. 45 sq.	yds.
Cement rubble masonry	٠		•						225 cu.	yds.
Structural excavation										

^{*} Evidently the unnamed cascade just above the bridge.

Tahoma Glacier.

Denman Falls.

Curb stones 113 lin. ft. Membrane waterproofing 190 sq. yds. 190 sq. yds.

As the above quantities were only estimates, and it is probable that adjustments had to be made due to field requirements. The specifications indicated that the Class "B" concrete (a 1:2:4 mix of Portland cement, sand and gravel) was to be used for the arch barrel and spandrel walls, and the Class "C" concrete (1:2.5:5 mix) for the arch footings."

Construction of the bridge began with the excavation of the abutments. By the end of September, the contractor had completed excavations for the foundations. The concrete for them was then poured, and timber falsework to support the arch ring was erected. The dimension of the arch ring stones or voussoirs was dictated by the architectural plans prepared by the National Park Service Division of Landscape Architecture. The voussoirs were cut to shape using plywood templates and the surfaces were carefully finished to ensure a tight fit. The stones were fitted with steel cramps to help bond them with the concrete which was poured against them. 13

Once the falsework was in place, the reinforcing steel was erected. All steel was 1/2" square deformed bars. Vertical bars were spaced on 12" centers; horizontal bars, of the same dimension, were spaced according to the curve of the arch. Transverse bars were set on 2' centers. All bars rested in hooped steel stirrups. 14

The following schedule was observed for pouring the concrete: First, the abutments were poured, and the arch ring stones were then fitted in place. After that, the concrete was poured for the crown of the arch, then for the lower arch haunches. This was followed by short, intermediate key sections between the haunches and the crowns. Next, a stepped section above the crown was poured, and finally, another stepped section over the haunches. Specifications instructed that the concrete from each pour was to cure at least three days before an adjacent section was poured. 15

Once the concrete was poured, the stone spandrel walls and wing walls were erected. The architectural plans specified that weathered stones should be used where possible. Joints between the stones were to be from 1° to 1 1/2° wide and raked out to a depth of 1°. A 3/4° expansion joint was located in each of the spandrel walls above the abutments, with the face stones breaking at the joints, which were packed with asphaltic filler and then painted with cement mortar. The top of the arch barrel and the inside surfaces of the concrete spandrel walls were then covered with a membrane waterproofing prior to the placing of the compacted earth fill. After the fill was placed, curb stones for the sidewalk and the masonry guard walls were then put in place. The bridge was then paved with 6° of crushed rock surfacing, completing the project. 16

Butler's contract was finished 17 August 1931. Total cost of the joint contract with the St. Andrews Creek Bridge, including BPR engineering fees, was \$41,985.94.17

Following the construction of the South Puyallup River Bridge, subsequent contracts extended the West Side Road north as far as Klapatche Point and then east to a crossing of the North Puyallup River, which was bridged in 1935. The road was extended no further; by this time, the National Park Service had determined to set aside the north and northwest portions of the park as roadless areas, and halted the West Side Road project.

Workers from Emergency Conservation Works Camp No. 4 cut out and opened up a vista at the bridge site in 1933. The ECW was affiliated with the Civilian

Conservation Corps, the massive Depression-era public relief program. Camp No. 4 was located at St. Andrews Creek, and its crews worked at times on roadside cleanup and highway maintenance along the West Side Road.

A bridge safety inspection report prepared by the Federal Highway Administration in September 1975 indicated that the South Puyallup River Bridge was in good condition. It stated that the approach alignment and deck geometry were "less than desirable," but no action was recommended. The H15 design load, capable of bearing two fifteen-ton trucks, was considered adequate for existing conditions. 19

The upper nine miles of the West Side Road, including the section on which the South Puyallup River Bridge is located, was closed to public travel following a debris flow on Tahoma Creek in 1989. Although the National Park Service was considering the repair and reopening of the road, access was limited to official vehicles when the site was recorded in the fall of 1992.

DESCRIPTION

The South Puyallup River Bridge is a stone-faced reinforced concrete filled spandrel arch bridge, measuring 90' in length and 34' 8" in width, out-to-out. It carries a 27' roadway and a 3' 3" sidewalk on the east or upstream side. The structure spans the river on a single semi-elliptical arch with a clear span of 42' rising 10' 5½" from the spring line. This arch springs from stepped concrete abutments resting on solid rock. The bridge is built on a broad curve of 36° radius and a 5° skew, and is considerably superelevated, rising a full 20° from the downstream to the upstream side. To account for this variance, the side walls of the bridge are at differing heights: the west or lower wall rises 6' 6" from the crown of the arch, while the upstream wall rises 8' 11". The granite masonry is laid in a rubble masonry fashion to emphasize the structure's rustic appearance. The bridge is surfaced with 6" of crushed rock on top of the compacted earth fill.

The bridge is located at an elevation of 3,490' in a mixed conifer zone; however, the streambed under the bridge features vine maples, alders and other bushy plants more generally associated with northwestern riverine environments. These plants quickly reestablish themselves after floods or debris flows. The structure itself receives only limited use from park patrol and maintenance vehicles, and nature is attempting to reclaim the site. Lichens and mosses have taken hold on the stone masonry facing, and a few plants and small trees have established themselves on the edges of the roadway deck. However, the structure itself appears to be in excellent condition.

III. ENDNOTES

- 1. C. R. Short, Reeident Engineer, Bureau of Public Roads, "Rainier National Park, Monthly Report," 3 October 1925, 2, attached to J. A. Elliott, Acting Dietrict Engineer, Bureau of Public Roads, to O. A. Tomlinson, Superintendent, Mount Rainier National Park, 30 November 1925. Mount Rainier National Park [MORA] Archivee, File D22, Conetruction Program 1925 file.
- 2. Idem, "Final Conetruction Report on West Side Highway, Southwest Entrance-Round Paes, Grading and Surfacing, Project 2-A, Mt. Rainier National Park, Rainier County (eic), State of Washington" (Portland, OR: Bureau of Public Roads, 1934), 5.
- 3. U.S. Department of Agriculture, Bureau of Public Roade, "Plane for Proposed Project 2-A, B1, South Puyallup River & St. Andrews Creek Bridges, Sec. A-Southwest Entrance-Round Paes; Sec. B-Round Paes-Klapatche Ridge, Route No. 2-West Side Highway, Mt. Rainier National Park Highway System, Washington," Construction drawings RG 177 A&B, 2 sheets (San Francisco, CA: Bureau of Public Roads, December 1929). Engineering Division files, Mount Rainier National Park.
- 4. U.S. Department of the Interior, National Park Service, Division of Landscape Architecture, "Architectural Plans, So. Puyallup River Bridge, Mt. Rainier National Park," Construction drawings B-63-AI, 2 sheets. (San Francieco, CA: National Park Service, Division of Landscape Architecture, 15 March 1930). Engineering Division files, Mount Rainier National Park.
- 5. Tomlineon, Superintendent'e Monthly Report, March 1930, 4. MORA Archivee, Box H2615, Superintendente' Monthly Reports 1926-1932 file.
- 6. Jos. M. Dixon, Firet Aeeietant Secretary of the Interior, to W. T. Butler Company, Seattle, WA, 15 July 1930. National Archivee, RG 48, Box 1991, File 12/7, Mount Rainier National Park contracte.
- 7. Tomlinson, Superintendent'e Monthly Report, July 1930, 13. MORA Archivee, Box H2615, Superintendente' Monthly Reports 1926-1932 file.
- 8. G. Gray Fitzsimone, Historian, National Park Service, Pacific Northweet Regional Office, Inventory form for South Puyallup River Bridge, Mount Rainier National Park Cultural Resources Survey, 12 September 1982.
- 9. J. S. Bright, Conetruction Engineer, for L.I. Hewee, Deputy Chief Engineer, Bureau of Public Roade, to Tomlineon, Superintendent, 7 June 1931, attachment; "Engineer'e Estimate for Proposed F.Y. 1931 Construction," attached to Ibid.. National Archives, RG 4B, Box 1991, File 12/7, Mount Rainier National Park contracts.
- 10. U.S. Department of Agriculture, Bureau of Public Roade, "South Puyallup River Bridge, West Side Highway, Rainier National Park Project 2-A," Construction drawing RG 176 A (San Francieco, CA: Bureau of Public Roads, March 1930). Engineering Division files, Mount Rainier National Park.
- 11. Ibid..
- 12. Tomlinson, Superintendent'e Monthly Report, September 1930, 7. MORA Archives, Box H2615, Superintendente' Monthly Reporte 1926-1932 file.

- 13. For details of the arch ring construction, see "Architectural Plans, So. Puyallup River Bridge," construction drawings B-63-AI, sheet 1.
- 14. U.S. Department of Agriculture, Bureau of Public Roads, "General Details, South Puyallup River Bridge, West Side Highway, Rainier National Park Project 2-A," construction drawing RG 176 B (San Francisco, CA: Bureau of Public Roads, December 1929). Engineering Division files, Mount Rainier National Park.
- 15. See the pouring schedule in Ibid ...
- 16. Ibid ..
- 17. Tomlinson, Superintendent's Annual Report, 1931, 13. MORA Archives, Box H2621, Superintendents' Annual Reports 1926-1932 file; W. H. Lynch, District Engineer, Bureau of Public Roads, Portland, OR to Chief, Bureau of Public Roads, Washington, D.C., 1 July 1932. MORA Archives, File D22, Construction Program 1932-1935.
- 18. O. E. Peterson, "Report on E.C.W. Camp 4, 31 October 1933." MORA Archives, Box H14, E.C.W. 1933 file, pt. 2.
- 19. U.S. Department of Transportation, Federal Highway Administration, "Bridge Safety Inspection Report, South Puyallup River Bridge, Mt. Rainier National Park Structure No. 9450-030P" (Denver, CO: Federal Highway Administration, Region 8 Office of Western Bridge Design, September 1975), 1.

IV. BIBLIOGRAPHY

- Dixon, Jos. M., First Assistant Secretary of the Interior, to W. T. Butler Company, Seattle, WA, 15 July 1930. National Archives, RG 4B Box 1991 File 12/7, Mount Rainier National Park contracts.
- Fitzsimons, G. Gray, Historian, National Park Service, Pacific Northwest Regional Office. Inventory form for South Puyallup River Bridge. Mount Rainier National Park Cultural Resources Survey, 12 September 1982.
- Lynch, W. H., District Engineer, Bureau of Public Roads, Portland, OR to Chief, Bureau of Public Roads, Washington, D.C., 1 July 1932. MORA Archives, File D22, Construction Program 1932-1935.
- Peterson, O. E. "Report on E.C.W. Camp 4." 31 October 1933. MORA Archives, Box H14, E.C.W. 1933 file, pt. 2.
- Short, C. R., Assistant Highway Engineer, Bureau of Public Roads. "Final Construction Report on West Side Highway, Southwest Entrance--Round Pass, Grading and Surfacing, Project 2-A, Mt. Rainier National Park, Rainier County (sic), State of Washington." Portland, OR: Bureau of Public Roads, 1934.
 - -- Rainier National Park, Monthly Report, 3 October 1925. Attached to J. A. Elliott, Acting District Engineer, Bureau of Public Roads, to O. A. Tomlinson, Superintendent, Mount Rainier National Park, 30 November 1925. Mount Rainier National Park [MORA] Archives, File D22, Construction Program 1925 file.
- Tomlinson, O. A., Superintendent, Mount Rainier National Park.
 Superintendent's Annual Report, 1931. MORA Archives, Box H2621,
 Superintendents' Annual Reports 1926-1932 file.
 - --Superintendent's Monthly Report, September 1930. MORA Archives, Box H2615, Superintendents' Monthly Reports 1926-1932 file.
- U.S. Department of Agriculture, Bureau of Public Roads. "General Details, South Puyallup River Bridge, West Side Highway, Rainier National Park Project 2-A." Construction drawing RG 176 B. San Francisco, CA: Bureau of Public Roads, December 1929. Engineering Division files, Mount Rainier National Park.
- --"Plans for Proposed Project 2-A, Bl, South Puyallup River & St.
 Andrews Creek Bridges, Sec. A-Southwest Entrance-Round Pass; Sec.
 B-Round Pass-Klapatche Ridge, Route No. 2--West Side Highway, Mt.
 Rainier National Park Highway System, Washington, Construction
 drawings RG 177 A&B, 2 sheets. San Francisco, CA: Bureau of
 Public Roads, December 1929. Engineering Division files, Mount
 Rainier National Park.
- -- South Puyallup River Bridge, West Side Highway, Rainier National Park Project 2-A. Construction drawing RG 176 A. San Francisco, CA: Bureau of Public Roads, March 1930. Engineering Division files, Mount Rainier National Park.
- U.S. Department of the Interior, National Park Service, Division of Landscape Architecture. "Architectural Plans, So. Puyallup River Bridge, Mt. Rainier National Park." Construction drawings B-63-AI, 2 sheets. San Francisco, CA: National Park Service, Division of Landscape

SOUTH PUYALLUP RIVER BRIDGE HAER No. WA-52 (page 9)

Architecture, 15 March 1930. Engineering Division files, Mount Rainier National Park.

U.S. Department of Transportation, Federal Highway Administration. "Bridge Safety Inspection Report, White River Bridge, Mt. Rainier National Park Structure No. 9450-028P." Denver, CO: Federal Highway Administration, Region 8 Office of Western Bridge Design, September 1975.